C interfaces to GALAHAD SEC

Jari Fowkes and Nick Gould
STFC Rutherford Appleton Laboratory
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Chapter 1

GALAHAD C package sec

1.1 Introduction

1.1.1 Purpose

Build and update dense BFGS and SR1 secant approximations to a Hessian. so that the approximation B satisfies the secant condition B s = y for given vectors s and y.

Currently, only the control and inform parameters are exposed; these are provided and used by other GALAHAD packages with C interfaces.

1.1.2 Authors

N. I. M. Gould, STFC-Rutherford Appleton Laboratory, England.

C interface, additionally J. Fowkes, STFC-Rutherford Appleton Laboratory.

Julia interface, additionally A. Montoison and D. Orban, Polytechnique Montréal.

1.1.3 Originally released

May 2008, C interface January 2022.

Chapter 2

File Index

2.1 File List

Here is a list of all files with brief descriptions:

Chapter 3

File Documentation

3.1 galahad_sec.h File Reference

```
#include <stdbool.h>
#include <stdint.h>
#include "galahad_precision.h"
#include "galahad_cfunctions.h"
```

Data Structures

- struct sec_control_type
- struct sec_inform_type

Functions

- void sec_initialize (struct sec_control_type *control, int *status)
- void sec_information (void **data, struct sec_inform_type *inform, int *status)
- void sec_terminate (void **data, struct sec_control_type *control, struct sec_inform_type *inform)

3.1.1 Data Structure Documentation

3.1.1.1 struct sec_control_type

control derived type as a C struct

Data Fields

bool	f_indexing	use C or Fortran sparse matrix indexing
int	error	error and warning diagnostics occur on stream error
int	out	general output occurs on stream out
int	print_level	the level of output required. <= 0 gives no output, >= 1 warning message
real_wp_	h_initial	the initial Hessian approximation will be h_initial $* I$
real_wp_	update_skip_tol	an update is skipped if the resulting matrix would have grown too much; specifically it is skipped when y^T s / y^T y <= update_skip_tol.
char	prefix[31]	all output lines will be prefixed by .prefix(2:LEN(TRIM(.prefix))-1) where .prefix contains the required string enclosed in quotes, e.g. "string" or 'string'

3.1.1.2 struct sec_inform_type

inform derived type as a C struct

Data Fields

int	status	return status. Possible valuesa are: • 0 successful return • -85 an update is inappropriate and has been skipped

3.1.2 Function Documentation

3.1.2.1 sec_initialize()

```
void sec_initialize (
            struct sec_control_type * control,
            int * status )
```

Set default control values and initialize private data

Parameters

out	*control*	is a struct containing control information (see sec_control_type)
out	*status*	is a scalar variable of type int, that gives the exit status from the package. Possible values are (currently): • 0. The initialization was succesful.

3.1.2.2 sec_information()

```
void sec_information (
            void ** data,
            struct sec_inform_type * inform,
            int * status )
```

Provides output information

Parameters

in,out	*data*	holds private internal data
out	*inform*	is a struct containing output information (see sec_inform_type)
out	*status*	is a scalar variable of type int, that gives the exit status from the package. Possible values are (currently): • 0. The values were recorded succesfully

3.1.2.3 sec_terminate()

```
void sec_terminate (
            void ** data,
            struct sec_control_type * control,
            struct sec_inform_type * inform )
```

Deallocate all internal private storage

Parameters

in,out	*data*	holds private internal data
out	*control*	is a struct containing control information (see sec_control_type)
out	*inform*	is a struct containing output information (see sec_inform_type)